

## THE IONOSPHERES OF THE ICY GALILEAN SATELLITES OF JUPITER

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The U.S. Galileo spacecraft, which has been in orbit around Jupiter since December, 1995, has provided opportunities to collect s-band radio occultation data using the 70 meter antennas of the NASA/JPL Deep Space Net(DSN) at Goldstone, California, Madrid, Spain, and Canberra, Australia.

To date, four occultations and one near-occultation by Europa (J2) have been observed. They have shown the presence of electron plasma having a density near the surface of 10,000 to 20,000 per cc (Kliore, et al., Science, 277, 1997). If the underlying neutral atmosphere is assumed to consist of H<sub>2</sub>O or O<sub>2</sub>, the maximum neutral density near the surface can be inferred to be about 10<sup>8</sup>.

Ganymede (J3) has also been observed five times by Galileo radio occultation. The results are almost entirely negative, with only one measurement out of ten yielding a possible observation of an ionosphere having a maximum density of about 5,000 per cc at an altitude of about 16 km. The failure to observe an ionosphere on Ganymede is surprising, in view of the detection of oxygen and hydrogen above its surface (c.f., Hall, et al., Astrophys. J., 499, 1998; Barth, et al., GRL, 24, 1997), but it may be due to the shielding effect of Ganymede's magnetic field upon the impinging magnetospheric particles from Jupiter's magnetosphere.

Callisto has occulted Galileo four times, and these observations have produced some puzzling results. Of the eight individual measurements, six are negative. The other two, however, show unmistakable classic ionospheric layers, having peak electron densities of 15,000 to 20,000 per cc, and plasma scale heights of 28-29 km. The peak altitudes differ - one is at about 23 km, and the other at 47 km. The presence of well developed ionospheres at one place and time, and not at others suggest a source of atmospheric gas that is variable in location and time.

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